

SPHERICAL DISPLAYS

TECHNOLOGY AND VISUALIZATION

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Advanced Visualization Lab

OUTLINE

- Overview of Science On a Sphere (SOS)
- IU Created datasets
- Visualization workflows for SOS
- Future Visualizations
- How to learn more

WHAT IS SOS?

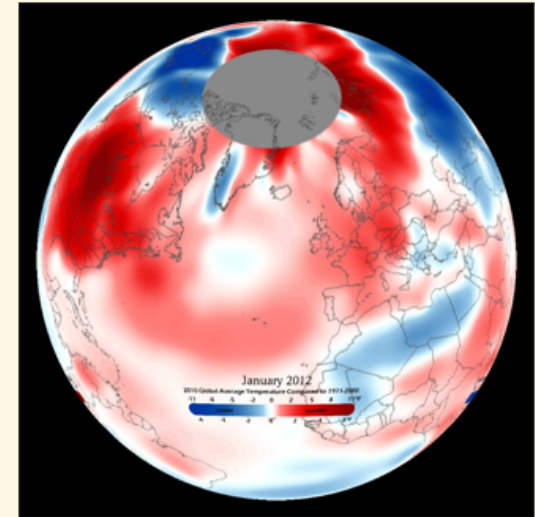
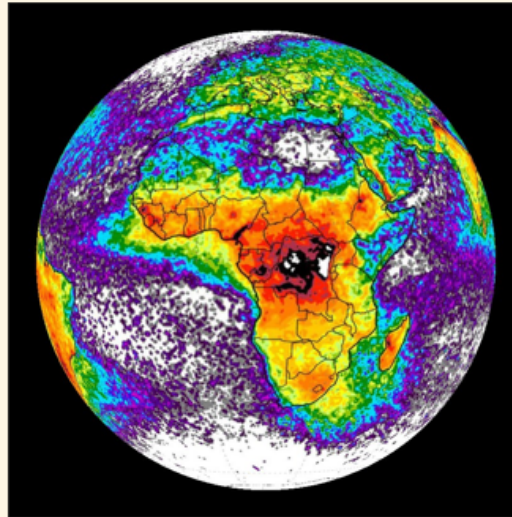
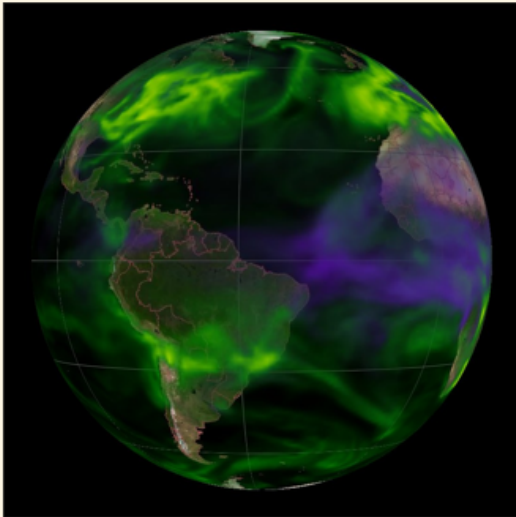
- Digital globe technology developed and promoted by NOAA
- Primary Purpose: Education and outreach
- IU one of only 6 schools (out of more than 100 installs)

TECHNICALLY - WHAT IS SOS?

- 6-foot sphere + 4 Projectors + Linux workstation
- NOAA created SOS Playback software & data distribution methods
- Media created in Equatorial cylindrical equidistant map
 - Uses Images and Videos

NOAA CREATED DATASETS

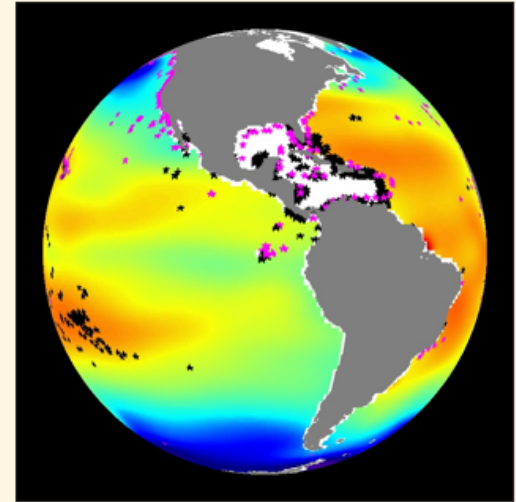
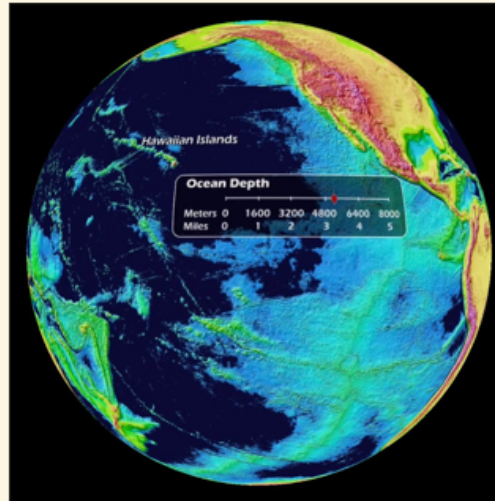
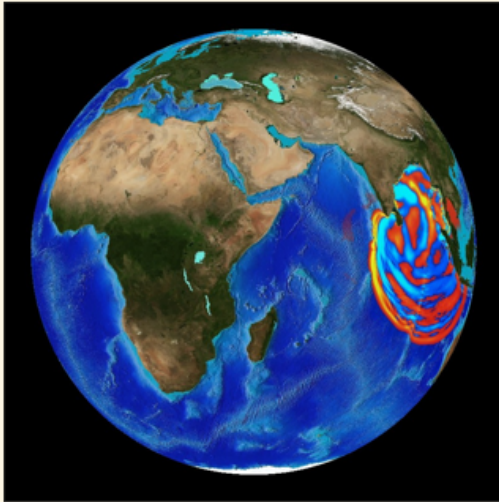
ATMOSPHERIC DATA



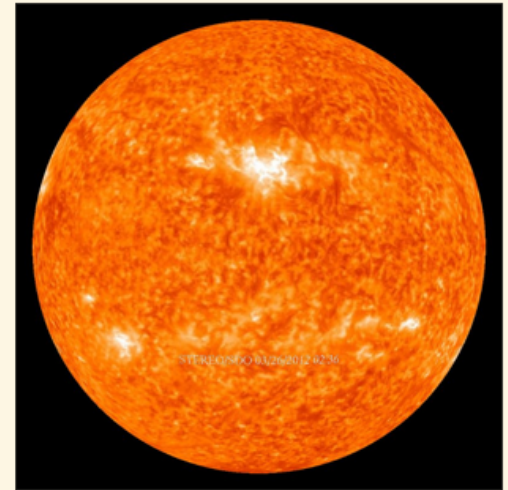
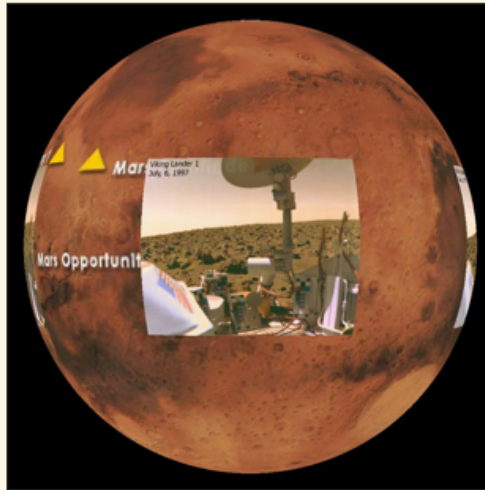
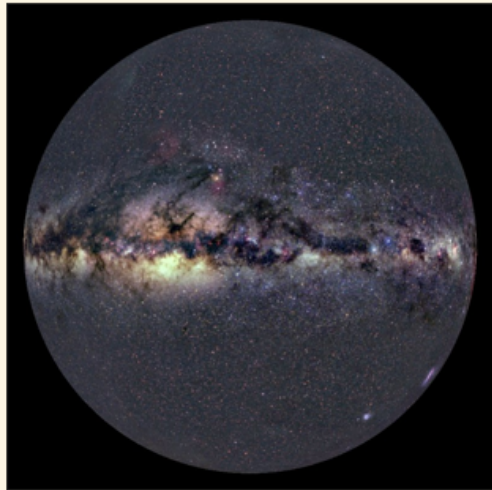
LAND DATA



OCEAN DATA



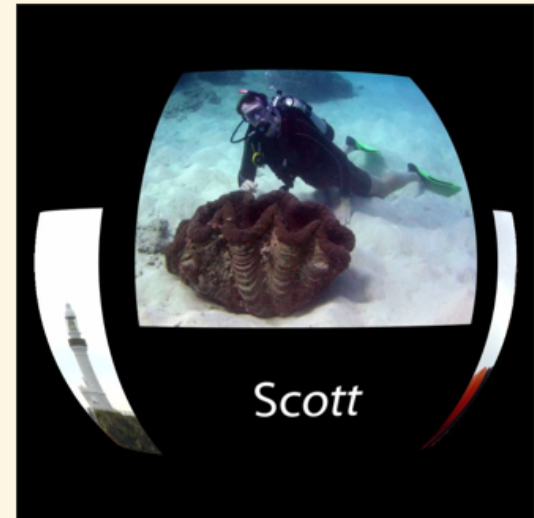
ASTRONOMY DATA



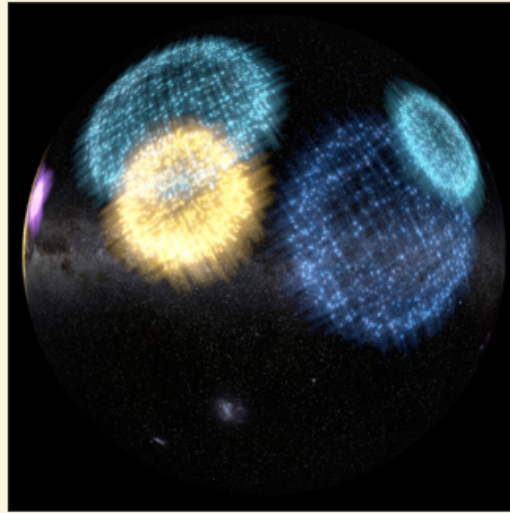
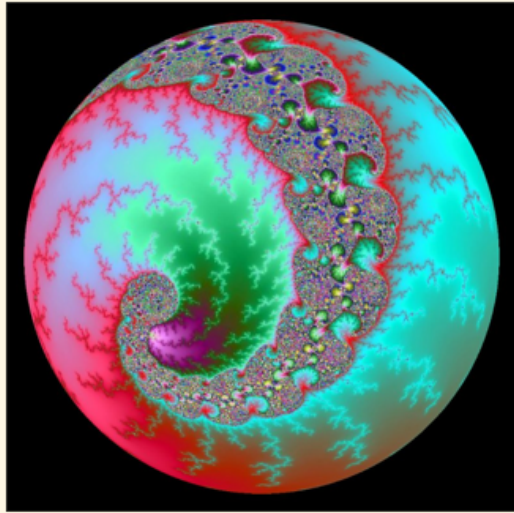
SOCIAL, ECONOMIC, AND NETWORK DATA



MOVIES



ART & CREATIVITY



IU DATASETS



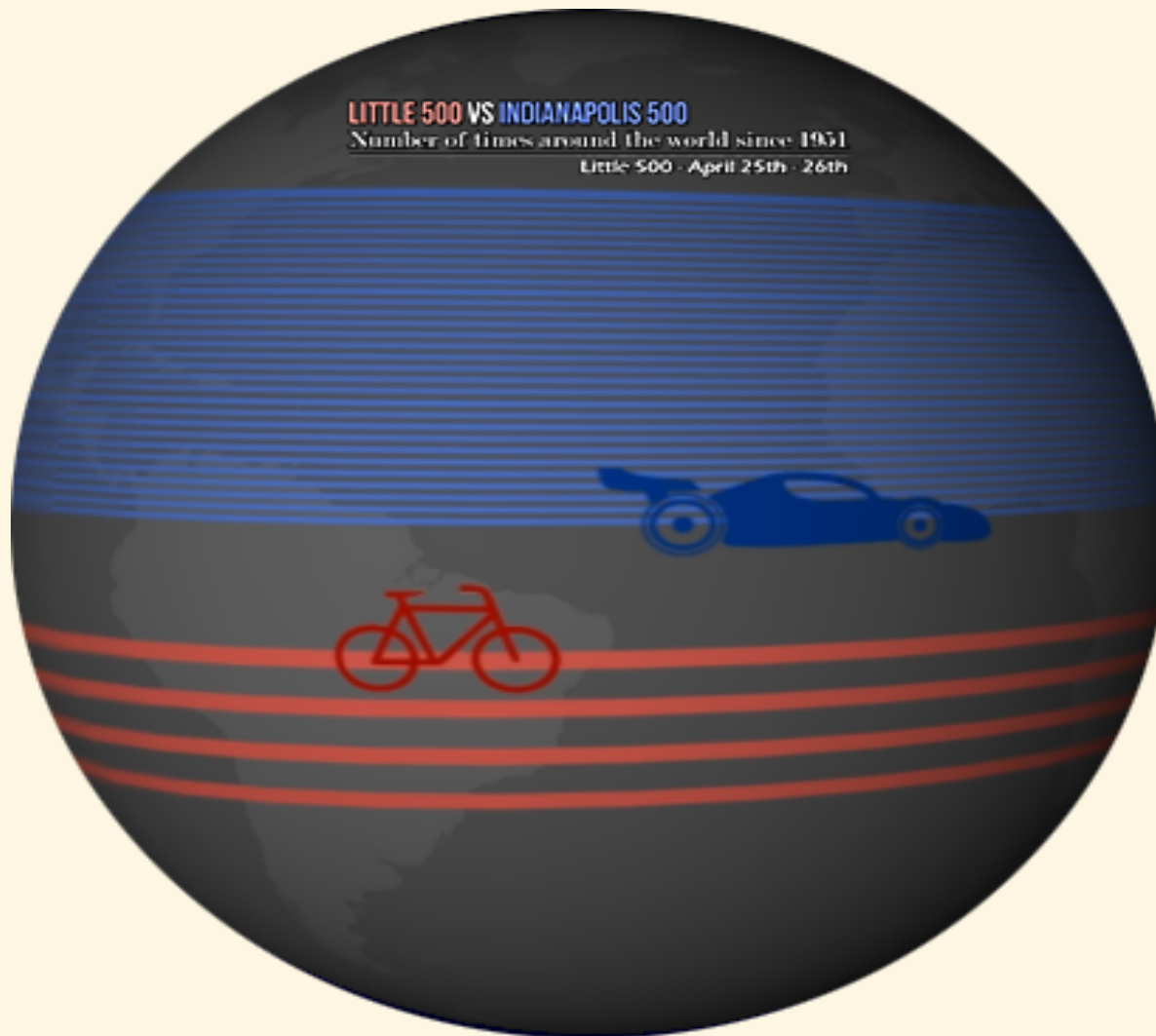
the
KINSEY
institute

Come explore with us.....

LITTLE 500 VS INDIANAPOLIS 500

Number of times around the world since 1951

Little 500 - April 25th - 26th



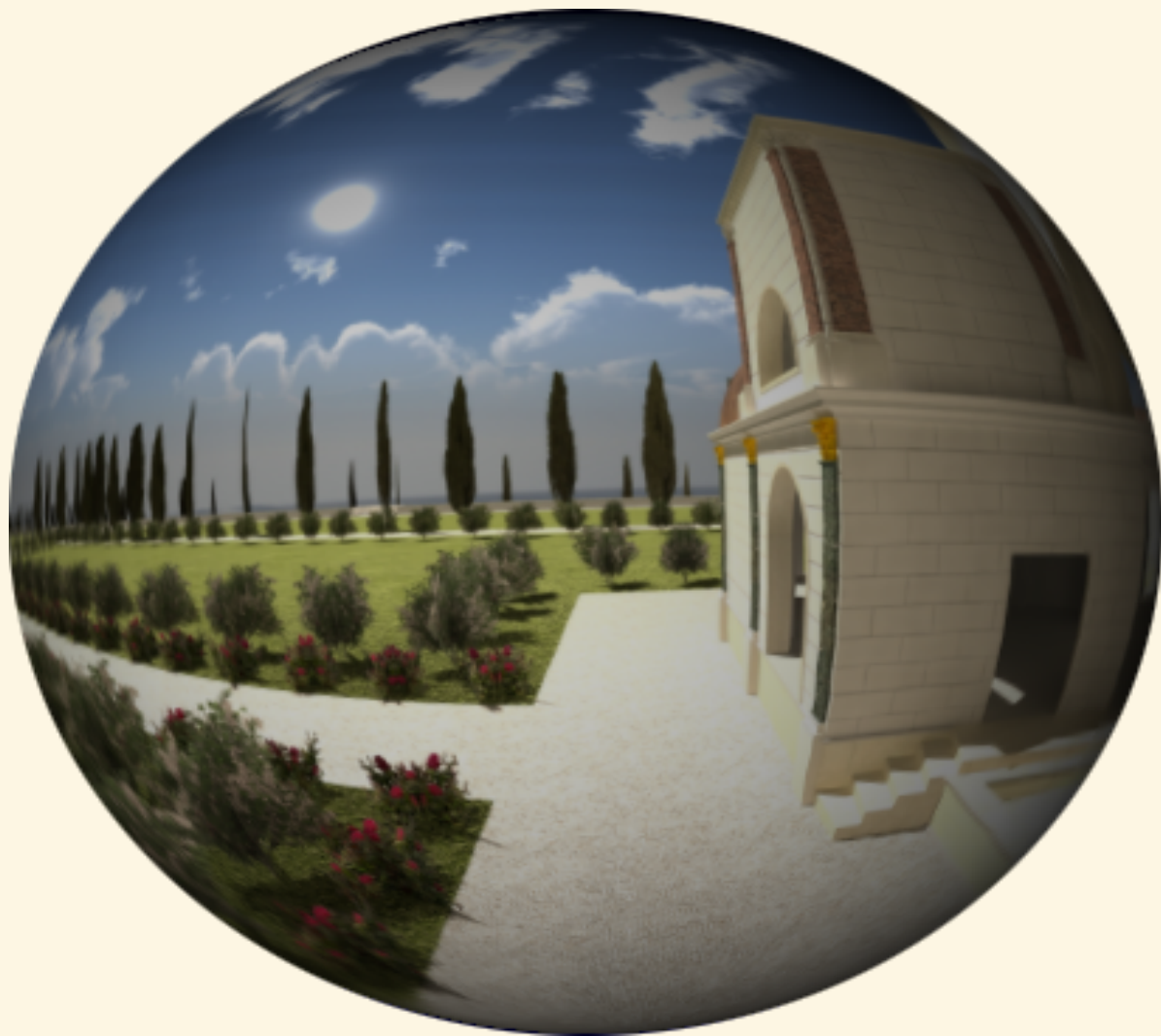
For Miller, one of the best parts of the mission is working alongside scientists.

"I work with data in my day job, but it's a whole other thing. I never look at it - it's just numbers."



OPERATION ICEBRIDGE
INARCTICA 2013 CAMPAIGN

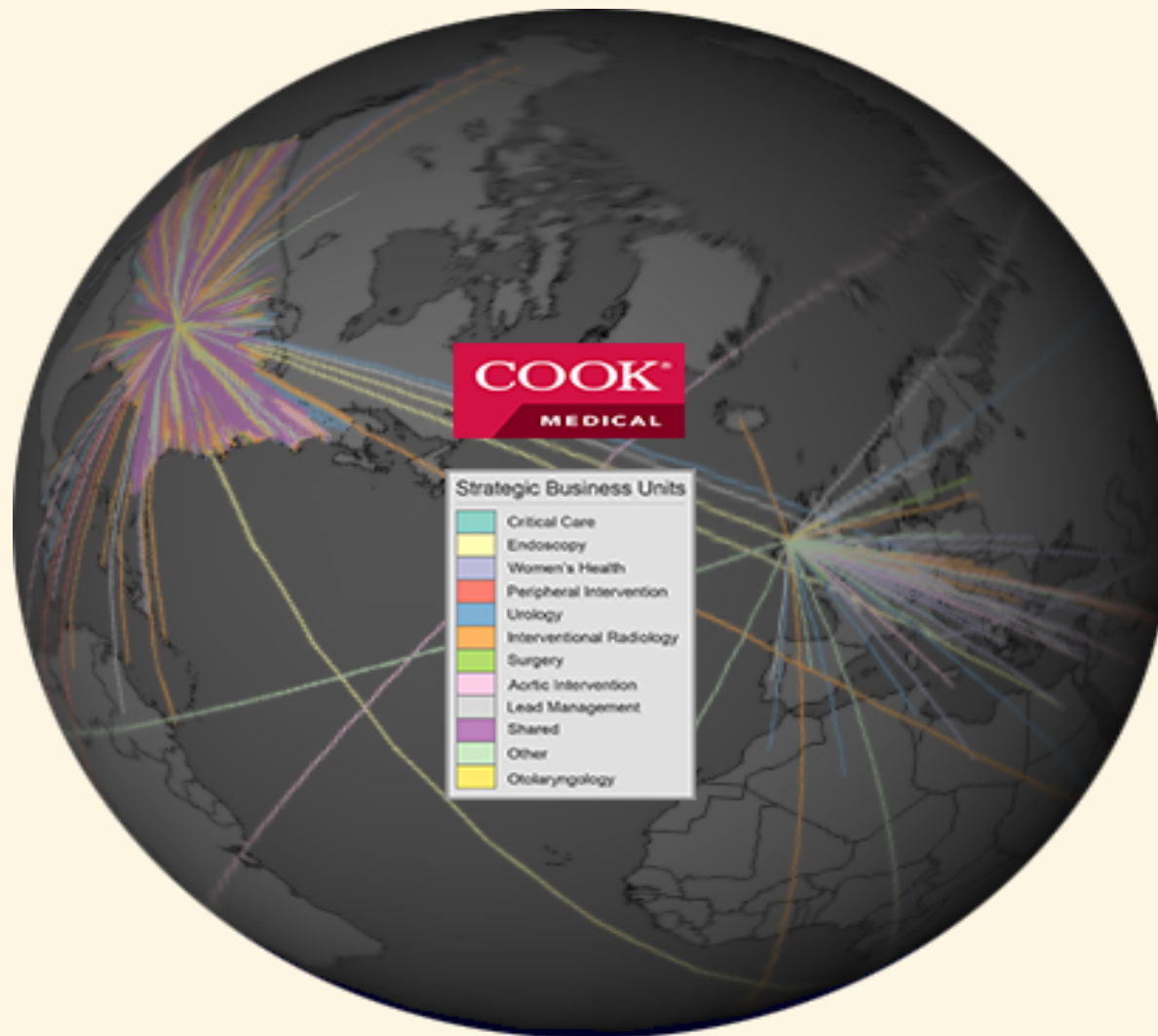






1991 - Exit Art
New York City, USA











DATA

WHAT WORKS BEST ON A SPHERE?

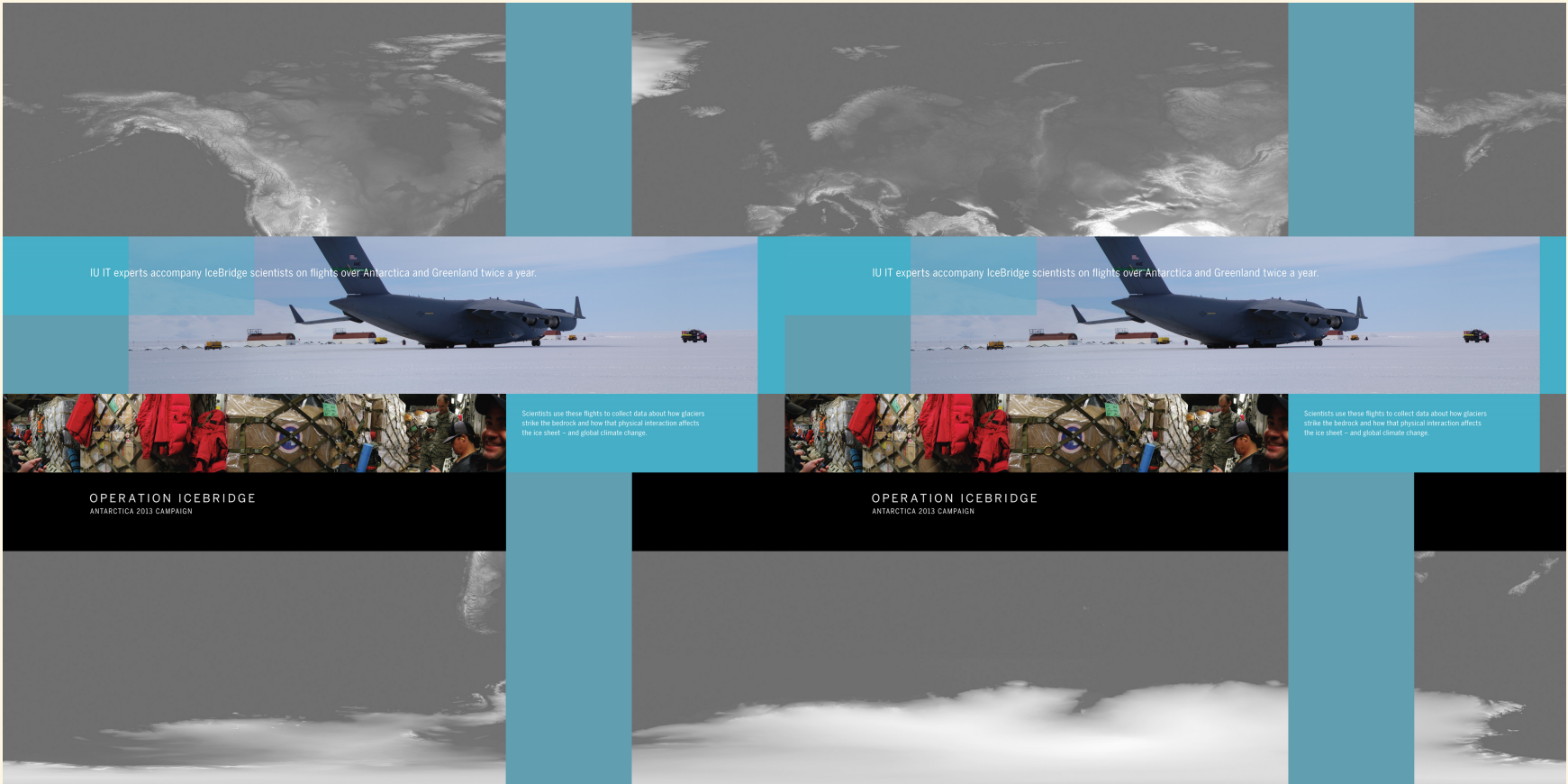
- Geographic data
- Non-geographic data
- Media

MEDIA

- Signage
- Spherical imagery
- Creative/artistic uses

SIGNAGE

- Usually don't care about distortion
 - Stay away from the poles
- Use standard design tools
 - Photoshop, Illustrator, After Effects, etc
- Repeat items 2-3 times so they are visible from all angles



IU IT experts accompany IceBridge scientists on flights over Antarctica and Greenland twice a year.

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Scientists use these flights to collect data about how glaciers strike the bedrock and how that physical interaction affects the ice sheet – and global climate change.

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OPERATION ICEBRIDGE
ANTARCTICA 2013 CAMPAIGN

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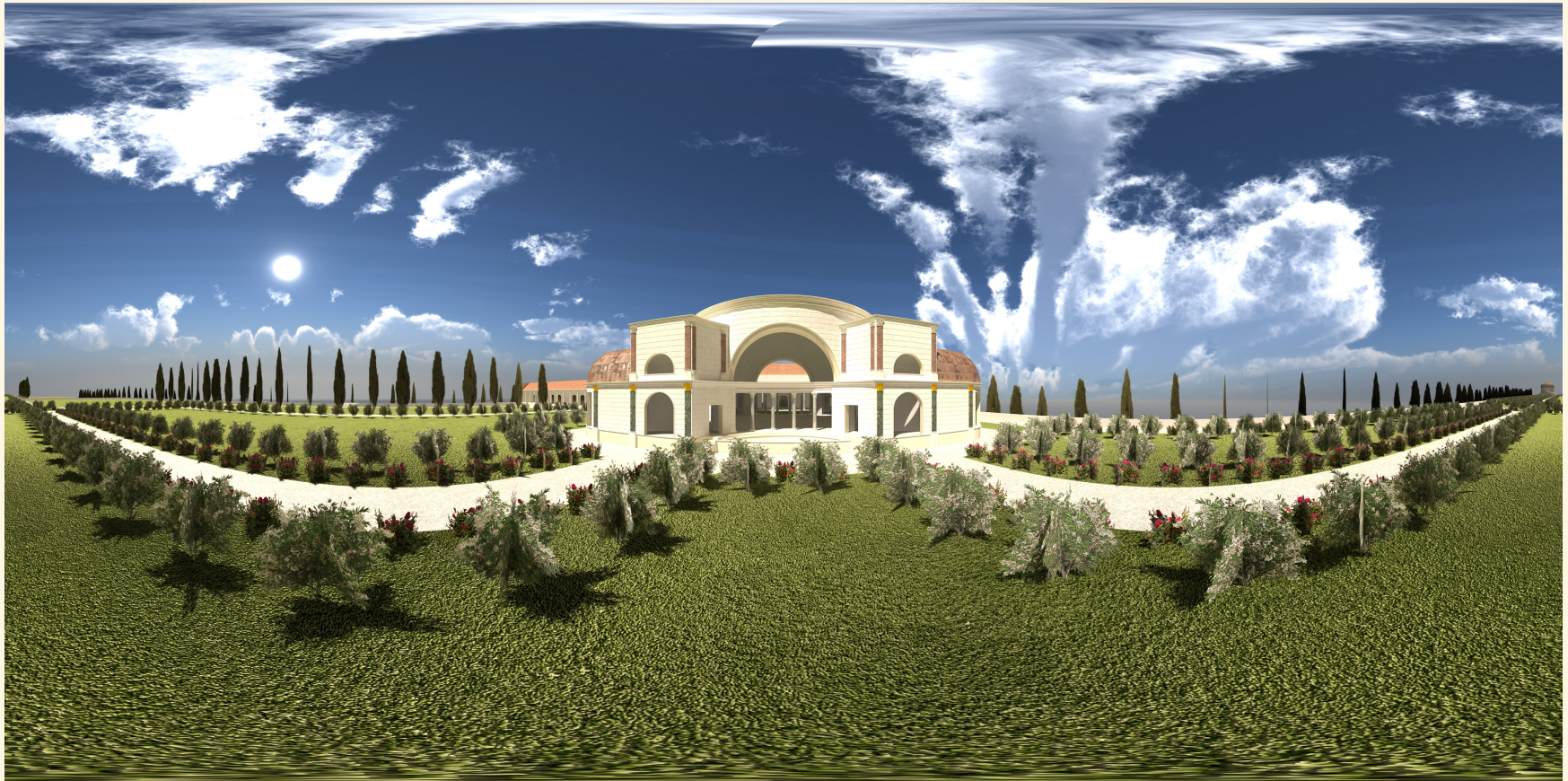
WHAT IF I DO CARE ABOUT DISTORTION?

- Fulldome plugin for After Effects
- Capture spherical images with the Ricoh Theta camera



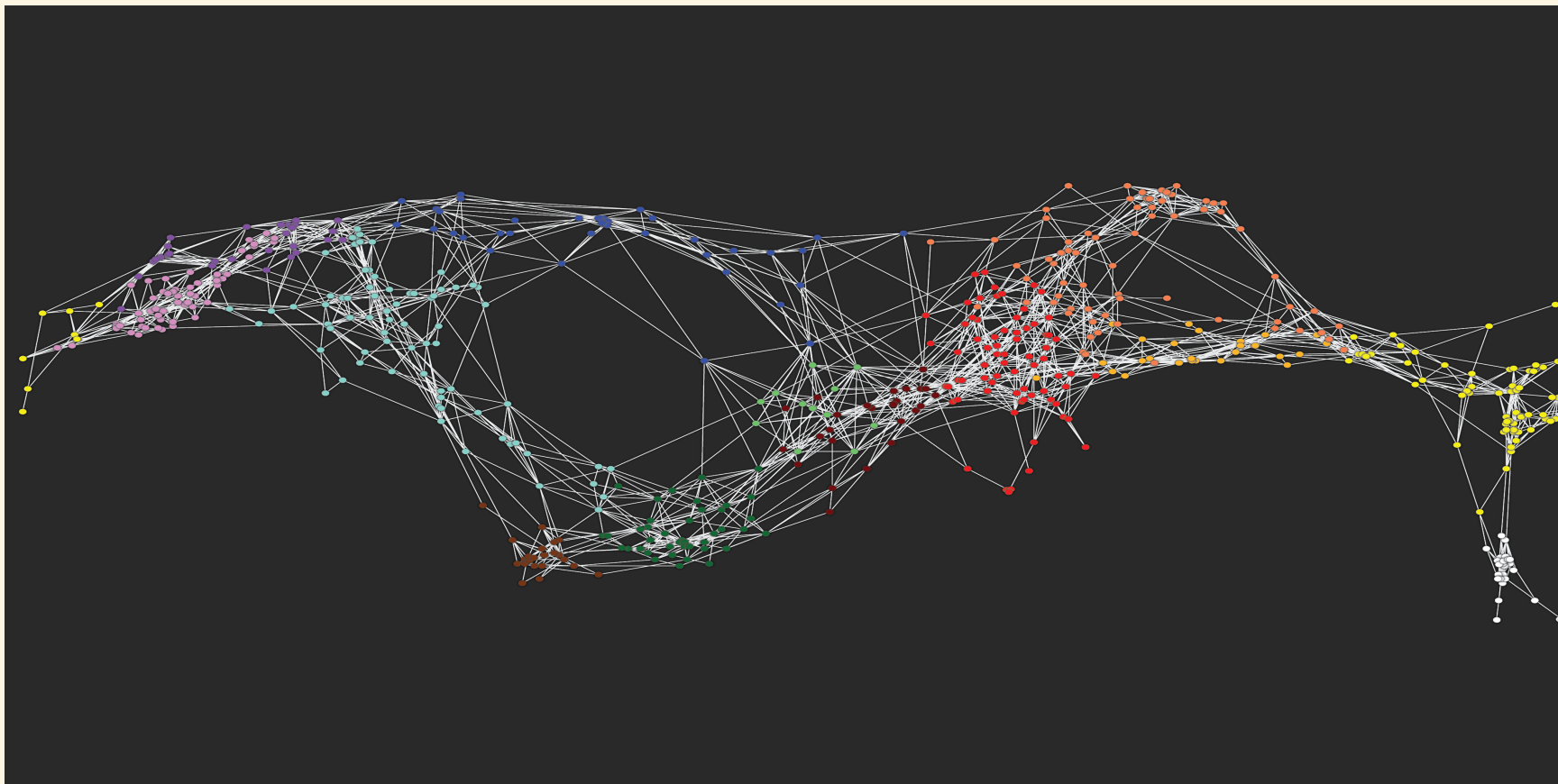
CREATIVE/ARTISTIC USES

- Unique canvas
- Same techniques as for general media, compensating for distortion as desired
- Capture spherical panoramas of virtual environments from Unity



NON-GEOGRAPHIC DATA

- Must be careful about distortion
- Quantitative data
 - Bar chart near poles
 - Radial bar chart in empty (ocean) space
- Part-to-whole
 - Pie chart as glyph
 - Pie chart in empty (ocean) space
- Networks



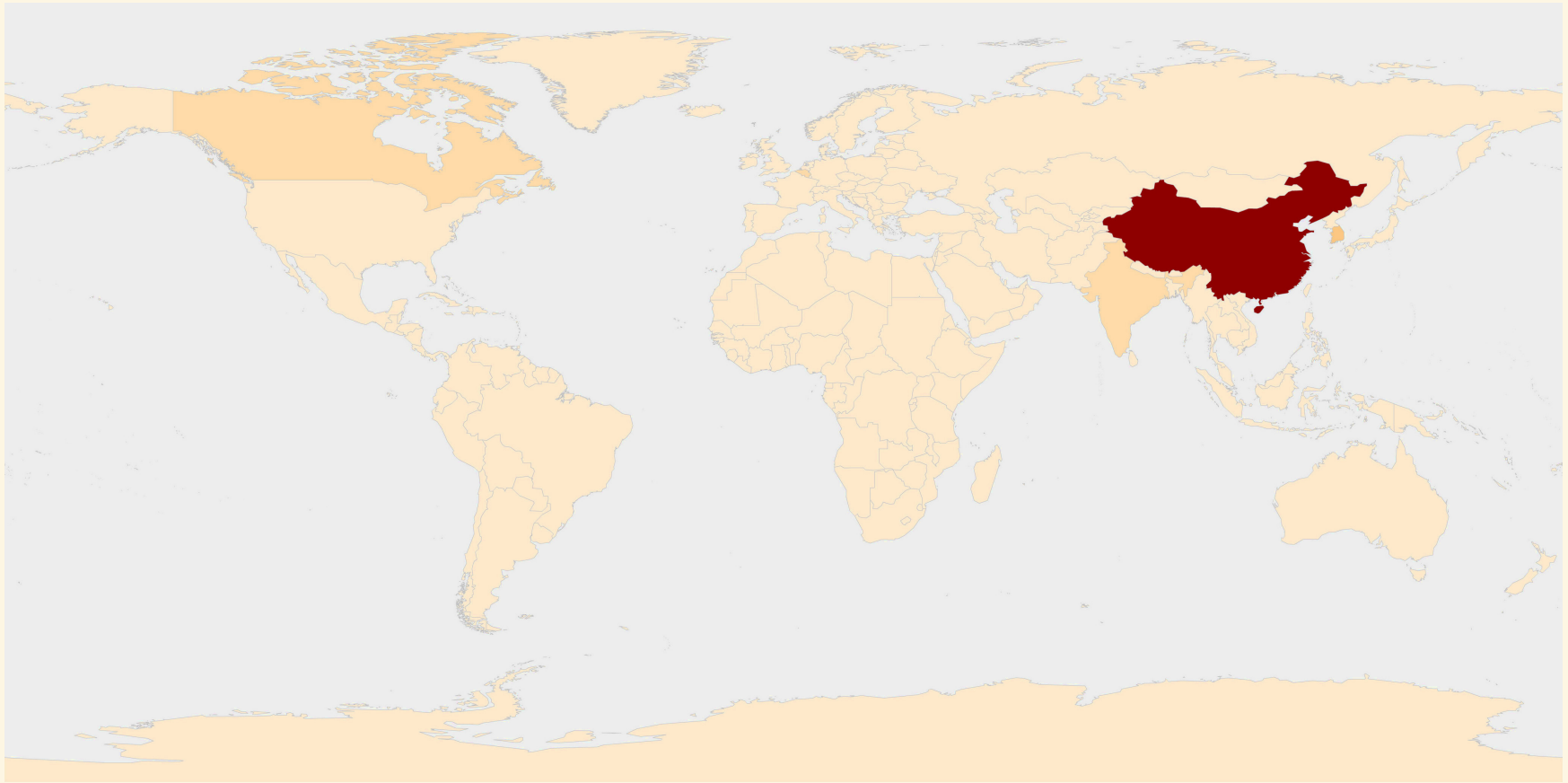
GEOGRAPHIC DATA

- Natural presentation, minimal distortion for maps
 - Watch for distortion on annotations, labels, symbols
- Keep it global
 - US only ~2% of Earth
 - Indiana only ~1% of US
- Keep it high-level
 - Aggregate data as necessary
- Must be in equirectangular projection

GEOGRAPHIC DATA

TOOLS FOR SIMPLE REPRESENTATIONS

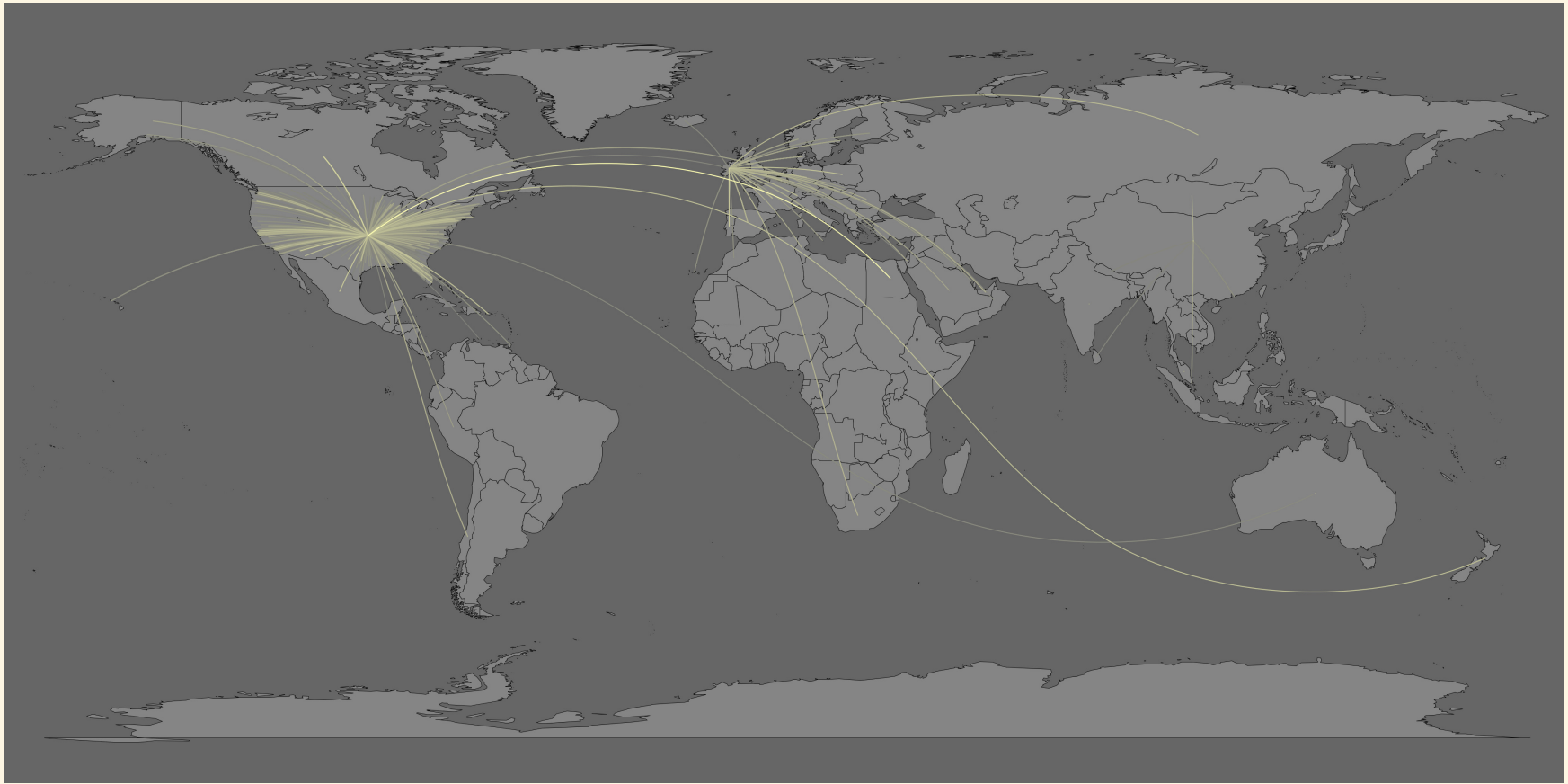
- Discrete locations on a map
 - SOS KML support
- Choropleth (Thematic) maps
 - Color regions based on value
 - indiemapper.com



GEOGRAPHIC DATA

CODE FOR COMPLEX REPRESENTATIONS

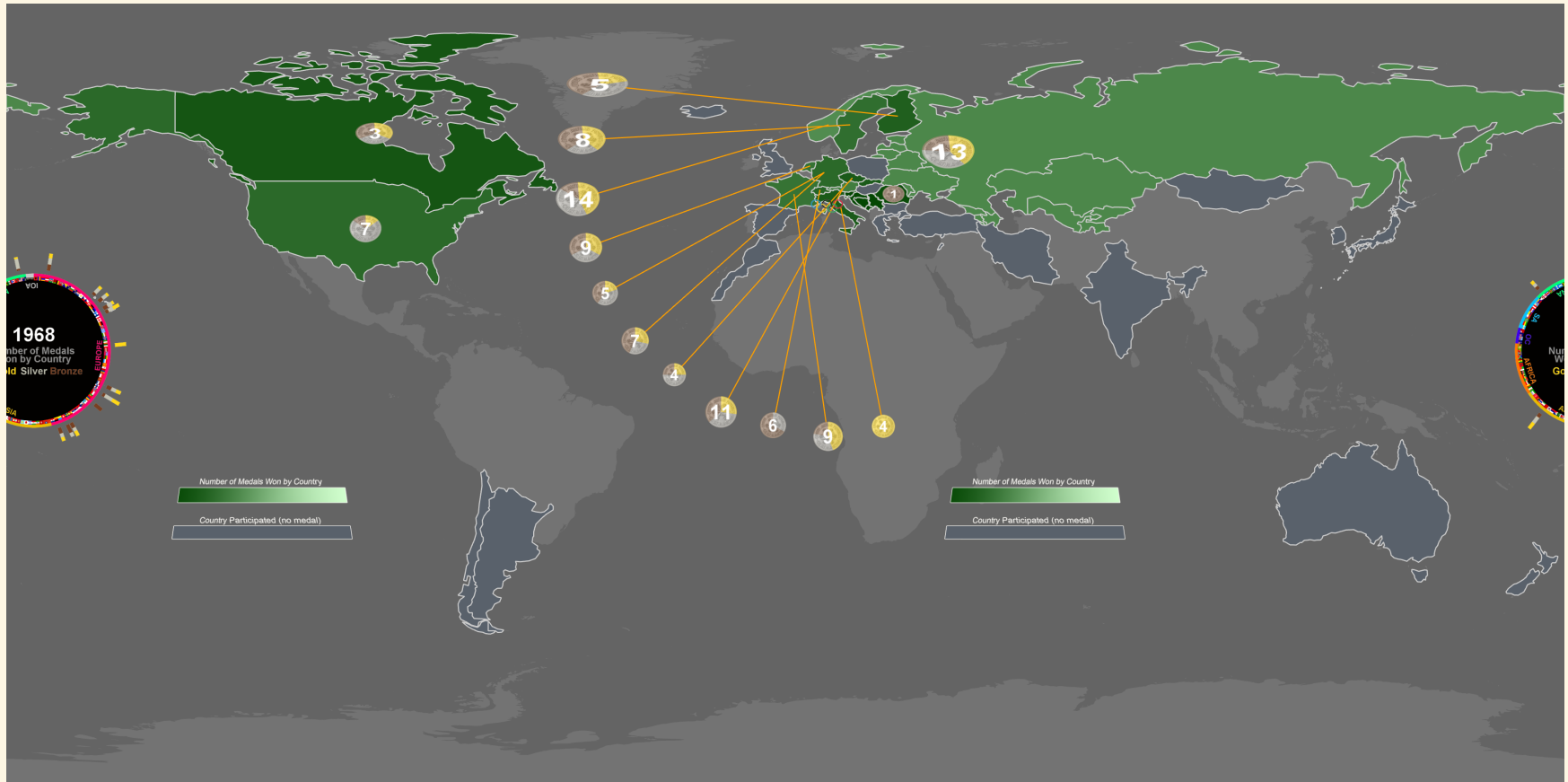
- Use your favorite programming language
 - Processing
 - R
 - D3
- Representations
 - Choropleth maps
 - Symbol maps (bubbles)
 - Networks (great arcs)



GEOGRAPHIC DATA

Pre-warp annotations, labels, and symbols to avoid distortion

Currently available only in Processing



WORKS IN PROGRESS

A few things we're working on for Supercomputing 2014...

GOOGLE STREET VIEW

USE STREET VIEW PANORAMAS ON SOS

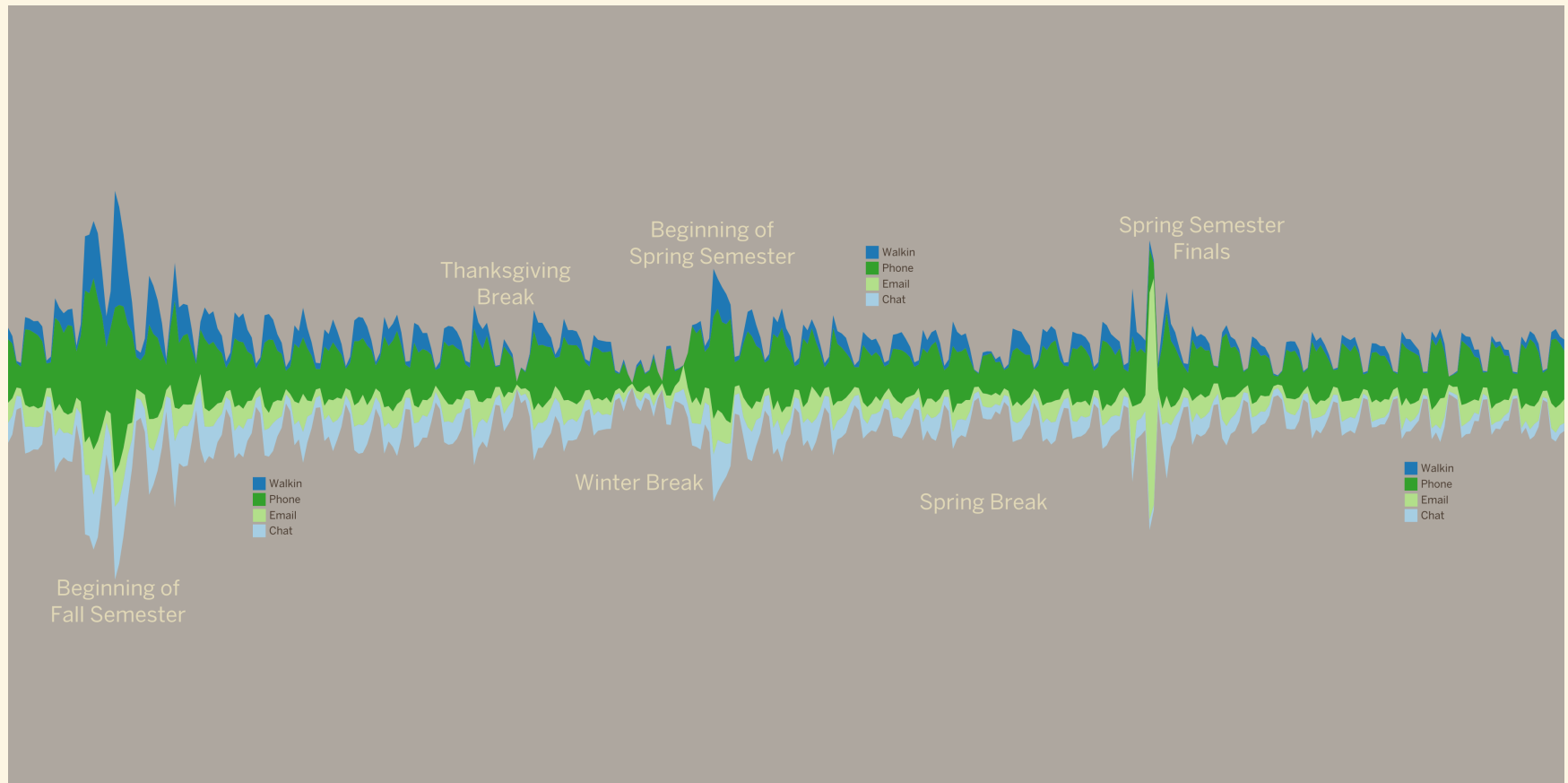
- User navigates to site, enters address
- Server on SOS host fetches imagery
- Server saves imagery in SOS format, updates playlist



STREAMGRAPH

HOW TO SHOW TIME-SERIES ON SOS?

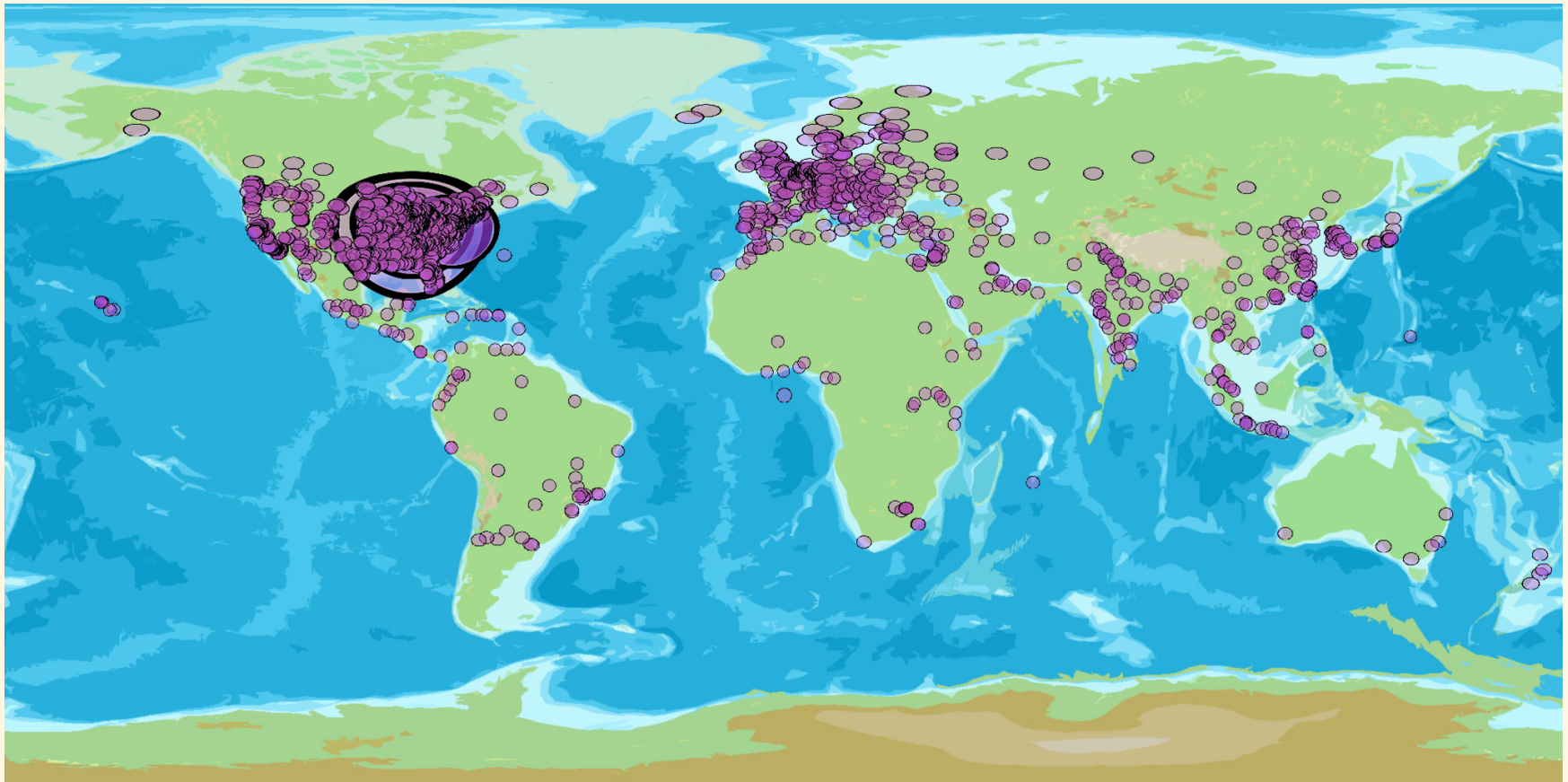
- Stacked area chart around equator
- Categories appear as colored "streams"
- Popularized by Last.FM listening histories



GOOGLE ANALYTICS

'REAL-TIME' ANALYTICS ON SOS

- Query GA periodically (hourly, daily, etc)
- Generate visualization programmatically
- Update SOS playlist with new data



HOW TO LEARN MORE

- Contact the AVL at vishelp@iu.edu
- avl.iu.edu
 - Systems -> Science On a Sphere
- View NOAA datasets at sos.noaa.gov